

Burnett (C. H.)

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# Aspergillus in the Living Ear.

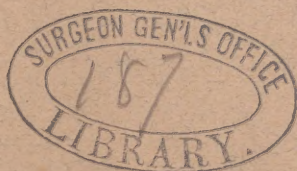
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By CHARLES HENRY BURNETT, M.D.,

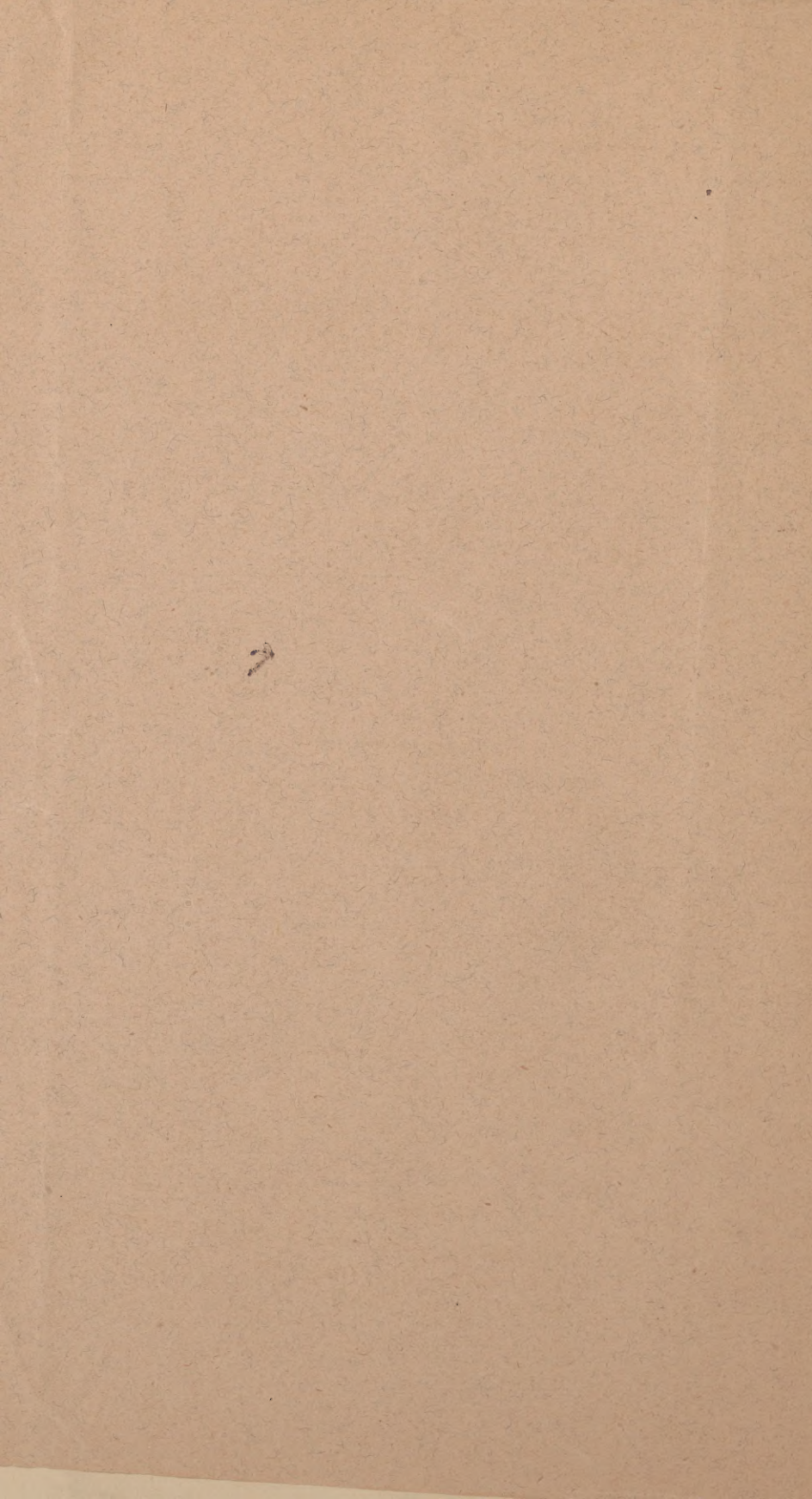
Aurist to the Presbyterian Hospital, and Consulting Aurist to the  
Pennsylvania Institution for the Deaf and Dumb,

Philadelphia, Pa.  
—♦—

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TWENTY CASES  
OF THE  
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LIVING HUMAN EAR.

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## TWENTY CASES OF THE GROWTH OF ASPERGILLUS IN THE LIVING HUMAN EAR.

By CHARLES HENRY BURNETT, M.D.,

PHILADELPHIA.

My apology for presenting this paper must be that clinical observations are always of value, whether they are confirmatory of the researches of others, or expository of the features of a disease and of simpler modes of treatment.

Although many of the readers of this account of the growth of a fungus in the ear—and I use the word fungus in purely a botanical sense—will be familiar with the literature pertaining to the subject, it will not be out of place to recall some of it, both to refresh our memory and to help those who have not had access to works setting forth the nature of this parasite as it shows itself in the living human ear.

It is to Wreden, of St. Petersburg, that the profession looks for the most voluminous account of the growth of this fungus in the ear, and of the aural disease produced by it, to which Wreden has given the very appropriate name of *Myringomycosis aspergillina*.<sup>1</sup>

The first observations of the growth of a fungus in living animal tissues were made by German and French writers, in the first half of this century, according to the work of Wreden already alluded to. These writers based their statements on what they found in the lungs and air-vesicles of birds. Virchow<sup>2</sup> too observed fungi, perhaps the aspergillus, growing in the lungs of man.

The first proof of the development of fungi in the ear of living man was given by Mayer,<sup>3</sup> and subsequently by Paccini;<sup>4</sup> still

<sup>1</sup> See his work, "Die Myringomykosis Aspergillina." St. Petersburg, 1868.

<sup>2</sup> Virchow's Archiv, Bd. IX., Heft 4, pp. 557-80.

<sup>3</sup> "Beobachtungen von Cysten mit Fadenpilzen aus dem äusseren Gehörgange." Müller's Archiv, p. 401, 1844.

<sup>4</sup> Supra una Muffa parasita (Mucedo) nel condotto auditivo. Florence, 1851.



later by Carl Cramer<sup>1</sup> and Schwartz<sup>2</sup>. It is highly probable that the cases thus reported were of aspergillus. Wreden's<sup>3</sup> first article on the subject appeared a year later than Schwartz's, and gave an account of six cases of the growth of aspergillus in the human ear. The species found were characterized by him as of the *A. glaucus*, Lk.

Then followed communications on this subject from numerous sources in Germany and in the United States: in the former country from von Troeltsch, Böke, A. Politzer, J. Gruber, Weber-Liel, Bezold, Lucae, Nölting, and others; and in our own land, from J. Orne Green, Roosa, C. J. Blake, and myself.

The vast majority of these communications have related to the aspergillus, although there have been some interesting exceptions which appear worthy of mention here.

Hassenstein and Hallier claim to have found in the ear of man the *Graphium penicilloides*; von Troeltsch, the *Ascophora elegans*; Schwartz and Steudener, the *Tricothecium*; Böke, the *Mucor mucedo seu fuscus*; and Blake, a bastard form of *Penicillium*. Wreden,<sup>4</sup> in one instance, found the most fully developed or ascomycete form of the *Aspergillus nigricans*, which from its intense purplish color he called, for the time, the *Otomyces purpureus*, but which on examination was not found to be a separate species of aspergillus; and Dr. J. Orne Green<sup>5</sup> has described a form of *Aspergillus rubens*, in which the fungus was, as indicated by the name given it, of a red color.

But all of these forms of fungus are of unfrequent occurrence, and would by their bluish or purplish color easily attract attention and at once indicate their nature as not that of ordinary aspergillus.

The Aspergillei belong to the division of the Fungi called Arthrospores. In the same division are other fungi which at times

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<sup>1</sup> Sterigmatocytis autacustica, a variety of Aspergillus. Vierteljahrsschrift d. Naturforscher Gesellschaft zu Zurich, 1859-60.

<sup>2</sup> Archiv f. Ohrenheilkunde, Bd. II., H. 1, p. 5, 1865.

<sup>3</sup> Ibid., Bd. III., H. 1.

<sup>4</sup> Archives of Oph. and Otology, 1874.

<sup>5</sup> Proceedings of Boston Society of Medical Sciences.

become parasites of living man, viz.: the Tricophyton, the Microsporon, the Achorion, and the Oïdium.

The Aspergillei form a family by themselves, according to Lévillé, having, according to Charles Robin, eight species. Some of these species have been found in tuberculous lung, notably in the lungs of birds, though also in that of man. To us, however, the most interesting species are those found growing in the auditory canal, and on the membrana tympani of living man.

This is no uncommon occurrence, yet doubtless it is not usually recognized, although exciting an inflammation of a decidedly peculiar form. Even the late Mr. James Hinton, of London, stated that he had not met it in his enormous practice, and doubted its existence in denizens of cities.

Dr. J. Patterson Cassells, of Scotland, is the only British writer on the observation of the growth of this fungus in the ear of living human beings.

Aspergillus is a form of mold, and shows a decided tendency to grow in the ear of man. It is believed by some to be ordinary mold modified by growing in living human tissue. It is not, however, identical, either macroscopically or microscopically, with the ordinary blue or green mold. From my observations I am inclined to believe that the Aspergillus found in the ear of living man is, as Wreden has termed it, the specific aural fungus. One thing seems fully settled: that the fungus is not found anywhere else in forms similar to those which flourish in the ear both of the lower animals and of man.

Two forms have been found in the ear of man, and have been called the *A. glaucus* and the *A. nigricans*.<sup>1</sup> But these terms do not recommend themselves as apt, because the color of the fructiferous hyphens, on which these names are based, is neither inviolable nor decided enough to render this nomenclature distinctive.

It seems to me that the terms *major* and *minor* would be preferable to *nigricans* and *glaucus* respectively. Here let me say I am speaking simply as a diagnostician of aural disease, and not as a botanist or mycologist.

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<sup>1</sup> Some writers give also an *A. flavescens*, but this is probably a term based on a different shade of color in the *A. glaucus*.



The so-called *A. nigricans* is by far the more common in its occurrence in the ear of man, and is larger in size than the *A. glaucus*, which is rarely found in the ear. As will be seen by referring to the cases I present, the *A. nigricans* was found in all.

These forms are easily distinguished from each other by the shape of their fruit-heads and the arrangement of the sterigmata thereon, and on these differences I would like to base their nomenclature. So far as their color is concerned, it is wholly unreliable as a diagnostic difference; in no instance is their color either clearly green or black. In all cases of ordinary aspergillus the color is yellowish or brownish. It has never been shown that one form excites an inflammation different from that produced by the other; but it may yet be shown to be of the highest importance in diagnosis to have for these fungi a definite name, for in whatever form they manifest themselves in the ear they excite a stubborn and painful disease.

For the sake of uniformity and order, I shall retain the names *A. nigricans* for the *larger* and *A. glaucus* for the *smaller* species.

*Microscopic features.*—The microscopic features of the growth of this parasite in the human ear are varied and full of interest.

If a small piece of a colony of aspergillus *nigricans*, in the earliest stages of its development, be examined under the microscope with a power varying from 250 to 300 diameters, a field similar to that in Fig. 1 will be observed. It is in fact the first formation of rootlets or the mycelial web from which, at a later period, the fruit-stalks or fructiferous hyphens spring. It will also be seen

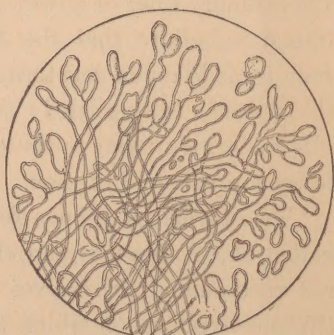


FIG. 1.

that some of the filaments composing the web tend to become bulbous at one end, and that the latter, as the stem grows, becomes larger and dotted (Fig. 2), until finally there is standing out from the dense web of mycelial filaments a perfect fruit-stalk and a fructiferous head—the latter studded with short peg-like limbs, the sterigmata, on the free ends of which are the spores. (Fig. 3, B.)



All of these stages of growth I have traced in specimens of the fungus removed from the human ear. In the fluid parts of the specimen, epithelium may usually be seen, in small quantities, as the parasite develops, as in the upper part of Fig. 2.

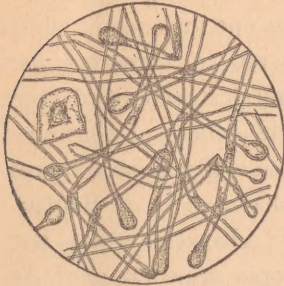


FIG. 2.

Very rapidly, in the course of a day or two at most, the perfect fruit-stalk is formed in large numbers and in all stages of development, and the mycelial filaments can be seen to be coarser and septate. On one hand may be seen a well-formed though unripe fruit-stalk

and head (Fig 3, B.), while in the centre of the field there may be seen the ripe aërial fruit, from which the fully grown spores drop, literally in myriads. (Fig. 3, C.)

The characteristic difference between the two varieties of *aspergillus*, the so-called *yellow* and *black*, is seen in the shape and size of the *receptaculum*, and the arrangement of the *sterigmata* upon it, these two parts forming the so-called "head" or *sporangium*.



FIG. 3.

In the *A. nigricans* (Fig. 3, B.) the sporangia or heads are distinguished from those of the *A. glaucus* (Fig. 3. A.) by the fact that in the first the sterigmata cover the receptaculum, which is spherical, on all sides, while in the latter, the lower fifth or fourth of the receptaculum, which is ovoid in shape, is entirely free from sporangia.<sup>1</sup>

Of the latter variety I have seen but one specimen, which, however, I did not remove from the ear. It was given to me by my friend and instructor in Heidelberg, Prof. Moos, who had removed it from the ear of one of his patients. The specimen I mounted in glycerine in the winter, 1870-71, and still retain it in

<sup>1</sup> See Wreden, Archives of Ophthalmology and Otology, 1874.

the same perfection in which I received it. Although there is some oleaginous matter, in which the fungus was found in the ear, still adherent to the specimen, there is no evidence of germination; yet it has been thought by Wreden that, in one instance in which aspergillus from the ear had been preserved in glycerine, germination went on to some extent.<sup>1</sup> In no instance have there ever been, in cases observed by me, any evidences of continued growth of this fungus after it had been placed in glycerine for preservation. But small portions of the mycelial web or of the fungous mass, as it comes from the ear, will, if placed in a glass box, continue to grow and to retain the microscopic appearance of *Aspergillus nigricans*.

From the fact of this retention of form, it would seem that this is a specific fungus, and not ordinary mold modified by growing in the ear.

It may be said, then, that in general there are found, with the aid of the microscope, four distinct elements in a fungous mass of aspergillus taken from the human ear, viz.:

1. The mycelial web, composed of the so-called tubules, rootlets, or filaments.
2. The fruit-stalk or hyphen, and
3. Its head or the sporangium.
4. The free spores.

The first, the filaments or tubular rootlets, are composed of sections, and are hence described as septate. The component cellules are from 0.020 mm. to 0.090 mm. in length.

The fertile hyphens or fruit-stalks vary in diameter from 0.009 mm. to 0.013 mm., and their length is 0.770 mm. These terminate in the so-called *receptaculum*, the placenta of Micheli, which has a diameter of 0.028 mm. (Robin.) On this grow the sterigmata and spores, the three together forming the so-called capital or head, 0.060 mm. in diameter, the third of the elements named above.

The spores are spherical, and measure 0.003 mm. in diameter. By careful fine adjustment of the lens, their surface is seen to be echinate. Some idea of the immense number of these spores in

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<sup>1</sup> "Die Myringomykosis," p. 6, Case II.



any case may be gained by Pacini's estimate, quoted by Robin, that there are *nineteen thousand* spores on each fruit-head.

*Macroscopic features.*—The macroscopic appearances of a mass of this fungus, as found in or washed from the ear, are worthy of attention. For, although the microscope must in every case decide the presence of aspergillus in a suspicious object coming from the external auditory canal, nevertheless the macroscopic features of a plug or membrane composed of this aural fungus are of a nature to lead the surgeon to suspect that he has to deal with a case of aspergillus in the ear. If an ear containing a mass of aspergillus be examined by means of an ear-mirror and ear-funnel, it will present most usually an appearance which leads to the supposition that the ear is occluded not by wax, but by a foreign matter of an organic nature.

If the fungus has not been growing long in the ear, merely a patch of pale yellow, pollen-like matter, of varying diameters, will be detected at the fundus of the auditory canal. This small colony of spores just developing into filaments, for such it is, is usually situate on the membrana tympani, or very near it. In any case, whether the first deposition of spores occurs there or not, the tendency of the aspergillus is to grow over the drum-head first, and from that point it spreads outward, covering the wall of the meatus, until a hollow cast of the canal is formed by the vegetable parasite. The pollen-like appearance is seen only in the very earliest stages of a growth of that which is finally a so-called lardaceous-looking or false membrane, either partially or entirely filling the external auditory canal.

In some cases the fungous mass looks like a ball or plug of wet newspaper, and in others the ear may seem to be plugged with a substance looking like wool. An inexperienced eye might conclude that the occluding plug thus formed is of ear-wax; but ear-wax looks more solid, shining, and drier, and it never excites pain and inflammation in the ear like the fungus aspergillus.

Another important point in differential diagnosis is that a mass of aspergillus does not lose its coherence when subjected to immersion in water or glycerine; but a lump of ordinary hardened

cerumen soon melts, and is diffused throughout the water or any other fluid in which it is allowed to lie.

Finally, the microscope would immediately show whether such a mass washed from the ear were aspergillus, or the peculiar laminated, epithelial plug, the so-called *Keratosis obturans* of Wreden.

The consideration of the symptoms, etiology, and treatment of the disease produced by the aspergillus in the ear will be deferred until after the recital of the cases.

CASE I.—*Aspergillus nigricans in the tympanic cavity*.—Miss M., eighteen years old, living in the best of hygienic surroundings, consulted me on October 10, 1872, respecting a chronic discharge from her right ear, attributed by her family to teething, since which time it had existed.

Upon inspection, a not copious, light greenish, purulent and odorless fluid was found in the fundus of the right auditory canal. The membrana tympani was destroyed, excepting small, crescentic portions on a level with and extending backward and forward from the short process of the malleus. The manubrium seemed shorter than normal, probably by foreshortening from the retraction the remnants of the drum-head must have undergone. The hearing for the watch in the affected ear was reduced to  $\frac{3}{10}$  ft. Under the use of astringents and daily syringing the chronic purulent discharge ceased, the membrana tympani was not restored, but the mucous membrane of the tympanum became dry, pale, and shining, and did not appear thickened.

About the 4th or 5th of July, six months after the healing of the ear as above described, the patient, while at her father's country-seat, took a bath in cold spring-water, and while in the bath voluntarily splashed cold water against the side of her head and into her previously diseased ear. This act was instantly followed by a sharp pain in the right ear, which, though not lasting long, was followed by a bloody discharge, the first escape of fluid of any kind from the ear since it was healed in the previous December.

The patient consulted me on the 7th of July, when the membrana tympani was found still further gone than when I last saw it, there being but a peripheral rim, and in place of the manubrium of the malleus there was a short, pendulous and movable body resembling the manubrium, which, by means of a probe, could be swung about in any direction without pain to the patient. The mucous membrane of the inner wall of the tympanum, as far as was seen, was thickened and very red, but the auditory canal was *entirely normal*.

A slight, purulent discharge came from the middle ear. The patient was ordered to syringe the ear and use instillations of a two-grain solution of sulphate of zinc, thrice daily, under which the discharge ceased. But in about



a month, *i. e.*, in August, 1873, the patient came to me with the statement that her ear was discharging again, but this time the matter was *different from any she had ever noticed before, as it was thin, transparent, and almost colorless*. It was then found that a pale yellowish, serous fluid was coming from her ear in small quantity, that the external auditory canal was entirely free from disease, that the tympanic cavity was congested, but that there was no pain nor pricking in the ear. The Eustachian tube was entirely pervious. The use of astringents and syringing was resumed and faithfully carried out by the patient, but, in spite of a variety of astringents both in weak and in strong solutions, the same thin, watery discharge continued from the ear. There was no pain nor itching, excepting when the astringents were put into the ear; then itching would be felt for half an hour sometimes.

The most that this treatment accomplished was a temporary cessation of the serous discharge for a week or two at a time, but it kept returning. It never grew any worse, but it never became materially better.

At last, on the 25th of May, about *nine months* after the first appearance of the watery discharge, the patient brought me a suspicious-looking pellicle, with dark brown spots on it, which she said she had syringed from her ear, stating also that it was similar to others she had at times taken from her ear, but of which no mention had ever been made to me. Portions of this spotted pellicle were examined with the microscope, and found to be composed of a dense mycelial web, with the aerial fruit and free spores of the *Aspergillus niger*.<sup>1</sup> The patient also informed me that she had removed similar spotted pellicles from her ear by means of a hair-pin, and she offered to make good her statement to this effect, then and there, if I would permit it. As I had just examined the ear, and found by inspection nothing that resembled the false membrane of aspergillus, curiosity as to whether and how she could produce a specimen of the fungus from her ear by this means led me to consent to her proposition. After she had bent a hair-pin at its curve into a miniature retractor, she passed it into her tympanic cavity, then turning her hook upward and backward toward the mastoid antrum, she skilfully and quickly made a gentle turn with the instrument, then withdrew it, giving herself no pain, and succeeded in removing, as she had said she could, a spotted pellicle similar to that described. Instantly this was examined under the microscope, and the aspergillus nigricans was found in various stages of development.

Here, then, was aspergillus *growing far in the tympanic cavity, and that, too, in the region of the tegmen tympani and the mastoid antrum*.

*Treatment*.—The patient was then told to use three daily instillations of absolute alcohol, or rectified spirits of wine, in the affected ear, and to syringe the ear most thoroughly and carefully with warm water. Several days later

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<sup>1</sup> Mistakenly reported as *A. glaucus* in the account of the case given in the *Transactions of the International Otological Congress*, N. Y., 1876.

the patient was seen, and it was found that numerous pellicles were coming from the ear, containing all the elements of aspergillus, but fewer free spores. The alcohol was found to have produced some burning when first applied to the ear, but subsequently this discomfort was not induced by its use.

In these later specimens of aspergillus from the ear there were found imbedded beautiful octahedral crystals, now supposed to be from the liquor potassæ used in preparing the specimen for the microscope. Under the treatment of the ear with alcohol instillations the watery discharge ceased, the aspergillus did not reappear, and the case was dismissed as cured.

In this, it may be said rare case, the fungus was not observed at any time in the external auditory canal, but apparently sprang up in the tympanic cavity, in parts invisible to the observer from without. Since, in an ear in which the membrana tympani is intact, the aspergillus always seeks the deepest parts of the externa auditory canal, and grows on the membrana tympani, it can easily be comprehended how, if this fungus attack an ear in which the membrana tympani is destroyed, the vegetable parasite, in its endeavor to find a secluded spot for growth, would spring up in the tympanic cavity rather than in the external auditory canal.<sup>1</sup> This same instinct of seclusion would also incline the aspergillus to seek those parts of the tympanum not easily visible or reached by the surgeon from without, as, for example, the inner surface of the remnant of the membrana tympani, the tegmen tympani, and the region of the mastoid antrum.

The only symptom of aspergillus in this case, until the spotted pellicles were found, was the thin, watery, serous discharge, which, however, might occur without the presence of aspergillus in the tympanum; unless it be found that the chronic, slight, serous discharges from the tympanum, which sometimes occur in cases where the membrana tympani is destroyed, are due to the unsuspected presence of aspergillus within the tympanic cavity.

In this case it must be supposed that the fungus either existed prior to the time I first saw the patient, or that it sprang up during the time she was under treatment for chronic discharge from the

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<sup>1</sup> For instances of the growth of aspergillus in the tympanic cavity, see Wreden, "Die Myringomykosis Aspergillina." St. Petersburg, 1868, pp. 24, 25, and p. 47; Politzer, Wiener Med. Wochenschrift, No. 28, 1870.



ear. The purulent nature of the discharge would exclude the first supposition, as purulent discharges are not found in connection with the growth of *aspergillus* in the ear; nor is it likely that the fungus sprang up in the ear while the patient was under treatment for chronic purulent discharges from the ear, since all aurists are agreed that usually thorough cleansing of the ear by syringing is sufficient to remove fungi from the ear. It is not probable, therefore, that the fungus developed in the ear while the patient was under treatment for aural discharge, prior to August, 1873.

It will be remembered that the patient was attacked with pain and renewal of the old purulent discharge after an accidental entrance of cold water into the ear, in July, 1873, and that this was cured. Between the time of this cure and the outbreak of the serous discharge, a month elapsed. During this month the fungus attacked her ear, just as it, in so many other cases, invades an ear that has been, but is no longer, the seat of active inflammatory disease. In such cases enough dead animal matter exists to invite the saprophyte, and to this, it seems, this patient owes her experience of the growth of *aspergillus* in the ear.

CASE II.—*Aspergillus nigricans* in the left auditory canal.—The patient, Mrs. W., forty years old, applied to me, September, 1873, for treatment of hardness of hearing and ozena, from which she had suffered for several years. In addition to this, as I learned subsequently, she had experienced numerous attacks of sudden and sharp pain in her left ear. The attacks lasted but a day or two, and were then followed by a slight watery or serous discharge from the affected ear. It was just after one of these attacks had ceased that I examined the left ear and removed a cast of the external auditory canal and drumhead. Before the removal of this cast from the meatus auditorius, the auditory canal, especially at its fundus, appeared lined with a piece of wet newspaper. This will best describe the appearance of the bottom of the canal before the removal of the fungous false membrane. As I had examined the ear for another purpose ten days previously, I knew that the fungus had formed within that time. By means of a pair of curved forceps, light being reflected into the meatus by means of a forehead mirror, the outer edge of the cast was seized and removed without any pain to the patient, for the mass of fungus was not adherent to the walls of the canal.

The walls of the auditory canal and the membrana tympani were thus exposed to view, but were not unusually red or sensitive. A drop of fluid taken from the auditory canal, and immediately examined under the microscope, re-

vealed the presence of numerous free spores of the *aspergillus nig.* and also numerous vibriones. There were, however, no pus-cells in the fluid thus taken from the meatus of the ear. The cast of the fundus of the auditory canal proved to be composed of mycelium richly studded with colonics of hyphens supporting large and beautiful sporangia of a dark brownish or blackish color. The hyphens were not septate, nor was there a membrane enclosing the sporangia. Imbedded in the mycelium there was a little epithelium, and scattered over it were myriads of free spores. The thalli were septate, and here and there I detected a little spot of bright green coloring matter in them. The spores were echinate. Though at that time I thought this was *aspergillus glaucus*, I now know that it was the *A. nigricans*.

*Treatment.*—The treatment in this case consisted of three instillations of a solution of nitrate of silver (100 gr. to f ʒj.), within the first ten days, and the repeated daily use of instillations of alcohol (90 per ct.) for one month. There was no return of pain, and the ear assumed its normal appearance in a few weeks.

So far as etiology is concerned, it may be said that this patient was living in a damp house, the cellar of which was moldy.

CASE III.—*Aspergillus nigricans in the right auditory canal.*—General —, of Conn., sixty years old, came under observation May 21, 1875, for chronic purulent disease of *right ear*, with perforation of the membrana tympani about the tip of the manubrium, and with thickening and cicatrization of the *left* drum-head in consequence of purulent otitis media on that side, the disease of both ears dating back to early life. There had been a gradual loss of hearing, and the patient had suffered from vertiginous symptoms and depression of spirits of late years. The chronic discharge was treated by syringing and the use of zinc drops, 5 grs. to f ʒj., without much benefit, as I learned subsequently by letter. On October 9, 1875, I saw the patient again. The subjective symptoms in the right ear had apparently changed since our last interview, for there were now experienced heat, pain, and fulness in the ear. The left ear remained as it was, being relieved from time to time by Valsalva's inflation. Upon inspection of the right ear by means of the aural mirror and funnel, it became very apparent that a false membrane had formed around and over parts of the membrana tympani and walls of the auditory canal. These being washed away, the membrana tympani was found red, swollen, and sensitive. The microscope having decided the true nature of the false membrane in the ear, as being composed of *aspergillus nigricans* in various stages of development, the patient was ordered to syringe the ear three times daily, and to instil into it absolute alcohol, allowing the latter to soak in the ear a minute. The alcohol applications burned a little, but caused no irritation.

By October 20th the ear was better, but not well, the patient having neglected to syringe the ear. But after this treatment had been carefully kept



up until November 3d, all discharge ceased, there was no trace of the parasite, and the membrana tympani had become thin, pale, and shining, the perforation in it still remaining. Syringing with warm water was kept up in this case until December 1st, when the patient was entirely able to cease all treatment, and then passed from further notice.

Here is another case in which aspergillus was found in an ear, the membrana tympani of which was perforated. There was a history of a very chronic discharge, of varying quantities, which, however, was checked by a rather short treatment of a parasiticidal nature. It looks as though the presence of aspergillus had been the chief and protracted, though unsuspected, cause of the chronic discharge. Although at times a catarrh may have caused the ear to run, still the aspergillus, with its pertinacity, hung about the ear and kept up the irritation and running. In some such way the great and prompt efficacy of alcohol, in some cases of so-called but vaguely termed otorrhœa, may be accounted for.

CASE IV.—*Aspergillus nigricans* in both auditory canals.—Mrs. S., of Philadelphia, thirty-five years old, came under observation November 11, 1875. The patient was living in perfect hygienic surroundings, and led a life of ease. Her general digestion was deranged, she being what is termed of a bilious temperament. She stated that for several weeks her ears had itched and become more and more uncomfortable to her, until at last they had grown painful, very tender to the touch and burning, and that at last they had broken out and a disagreeable and irritating, though scanty, watery discharge, had come from each ear. On examination, well marked acute eczema of the auricles was seen to be present, and the meatus was plugged up with gray, damp masses of epithelium. Upon syringing out the ears, each membrana tympani was found obscured with whitish flakes, and the walls of the canals were more or less broken by the scratching of the patient. The hearing was dulled. The microscope revealed the presence of the aspergillus.

*Treatment.*—The treatment was necessarily mild, on account of the abraded and eczematous state of the ears. It consisted in my thoroughly cleansing the ears and in dusting over the eczematous concha and meatus a powder composed of equal parts of Hubbuc's oxide of zinc and starch. For the dyspeptic symptoms, Huxham's tincture was taken and relief was obtained. In twenty-four hours the eczema had greatly subsided and the ears felt much more comfortable. The canals were still red, and at spots on the lower wall the skin was fissured. I saw the patient every other day and powdered the ears as above stated, obliging the patient to leave the powder in the ears, and I removed any

flakes or scales which might have formed in the canal. The membrana tympani gradually became more healthy in appearance, and the glandular swelling about the ear went down. On the 17th of November I found around the meatus of the left ear a fresh growth of aspergillus. It had sprung up very near the opening of the canal, and its peculiar fuzzy or downy appearance was visible to the naked eye. The color was slightly yellowish, and any one looking closely at the ear would have been attracted by the appearance of this formation at the mouth of the canal. This was removed by gentle scraping, and the ear syringed with alcohol and water. The ear was closely watched and the eczema combated by mild means, and by December 1st all traces of aspergillus had disappeared. A little pruritus still annoyed the patient, but this was allayed by warm water.

*Etiology.*—In this case the patient said, on being closely questioned, that the earliest feeling which attracted her attention to her ears was itching, to relieve which she had scratched her ears inordinately with hair-pins. Here the means of ready abrasion of the skin was offered, and gradually a soil composed of minute portions of dead skin, serum and blood was provided for the fungus, which lost no time in settling on the ear. This of course produced more discomfort and itching, to relieve which the fingers and the hair-pin were again employed, eczema was gradually excited, and the ear started on the vicious circle so often seen in cases of aspergillus in the ear. It is indeed difficult to say, in some cases, whether the first irritation felt in the ear is due to the presence of the aspergillus, or whether the ear begins to itch from some ordinary cause, and then, being unduly scratched and abraded, the aspergillus finds favorable soil for development; but I am inclined to the latter view.

CASE V.—*Aspergillus nigricans in the left auditory canal.*—Mr. E. C. A., of Buffalo, N. Y., twenty-eight years old, merchant, came under observation September 8, 1876. The patient was led to seek relief from excessive pain in the affected ear—in fact, the fungous growth produced much more pain in this case than in any I have observed. The concha and meatus were excessively tender and inflamed, and from the mouth of the canal a dark object was seen projecting. The hearing was greatly reduced. By syringing, large lumps of what was found to be masses of aspergillus were washed from the ear, but the membrana tympani was covered by an adherent grayish false membrane of fungous mycelium.

*Treatment.*—In this case the patient was advised to instil absolute alcohol into his ear thrice daily, but not to use the syringe; and this method of treating aspergillus in the ear I have found very satisfactory. The alcohol kills the parasite and causes all adherent parts to become detached. These can be syringed out by the surgeon every day or two, but the use of the syringe on the patient's part, in such cases, is better dispensed with, as it has often seemed to irritate the ear.

*Etiology.*—The etiology in this case is obscure. There was history of ear disease for which the patient had been treated in his own city and for which nitrate of silver had been used, which, in all probability, had stained the masses of aspergillus, for all the fungus in this case was abnormally black, looking like black wool, as it came from the affected organ. Under the microscope the blackness was shown to be due to artificial causes. In four days, by the use of the above-named treatment, the fungus disappeared from the ear and the membrana tympani became shining and lustrous.

CASE VI.—*Aspergillus nigricans in the right auditory canal.*—Miss A., of New York City, thirty-five years old, came under observation September 16, 1876, with a card of introduction from Dr. Roosa, who had found aspergillus in the right meatus. On close examination of a small pellicle removed from the left external auditory canal, I found a few fruit-heads of the aspergillus. There was no inflammation of the ear in this case, but only a slight itching.

*Treatment.*—There was no local treatment in this case, but the patient being a little run down from visiting the Centennial Exhibition, iron and quinine were administered with good effect. There was no return of aspergillus in this case as long as she was under my observation. Here again the aspergillus was found in an individual living in the best of circumstances.

It is interesting to note that the parasite may grow in small quantities in the ear without exciting local inflammation. This patient had suffered from pruritus of the auditory canals, and if rough scratching had been indulged in, it is probable that the fungus would have had more encouragement than it received, to extend its growth.

CASE VII.—*Aspergillus nigricans in the right auditory canal.*—Mr. B. F. J., of St. Louis, Mo., came under observation October 13, 1876, with a letter of introduction from Dr. H. N. Spencer.



The patient, a clerk, was forty years old, and had suffered many years with chronic discharge from both ears. He had at last applied to Dr. Spencer, who had found aspergillus in the ear, but had succeeded in removing it, allaying the discharges to a great degree and improving the hearing greatly.

Upon examination, I found that the left ear was not discharging, and that the auditory canal on that side was filled with hardened crusts of purulent matter and epithelial débris.

On the right side, however, the patient complained of discomfort, fulness, burning, and a slight watery discharge, in fact a renewal of the symptoms, which had been relieved for him by his physician at home. On inspection, the membrana tympani was found covered by a delicate false membrane of aspergillus.

*Treatment.*—The treatment consisted in instillations of absolute alcohol, three times daily, the dose being from ten to fifteen drops each time. Though the ear became better, the patient passed from observation before I was satisfied that the ear was entirely free from aspergillus.

CASE VIII.—*Aspergillus nigricans in the right auditory canal.*—The patient in this instance, a lad of fifteen years, from Georgia, was the youngest person in whose ear I have found the aspergillus.

This case came under observation, October 28, 1876, for hardness of hearing. The lad stated that during the previous summer his ear had throbbed and itched, for which the syringe was used, with some relief. Since then the ear had felt more or less stopped up.

On inspection, an obstructive mass was seen in the canal, which, on being washed out by means of the syringe, I found to consist chiefly of aspergillus in all stages of development, preserved as it were in a cyst of cerumen.

The *treatment* consisted in the use of alcohol instillation for a few days, and there was no return of the fungus.

This case, aside from the youth of the patient, presented a curious example of the presence of aspergillus in the ear, without the characteristic symptoms of heat, sticking pain, and watery discharge, for it seems probable that the fungus had been in the canal for some time, as the removed mass was covered over with wax and dead skin. I have observed that the aspergillus will not flourish in the presence of cerumen, *i. e.*, not to an extent sufficient to inflame the ear, and thus its long and harmless presence in the ear may be accounted for in this instance. This fact of the protective value of cerumen is further shown in those cases where the cerumen has been scraped from the ear, through a mistaken idea of personal cleanliness. In such cases, aspergillus is almost sure to

spring up, and, on inquiry, there will be elicited the fact that the ear has been scratched, either with pins, hairpins, ear-picks, or some other equally pernicious implement, for the purpose of "cleaning the ear."

CASE IX.—*Aspergillus nigricans in both auditory canals.*—The patient, H. B., aged seventeen years, does not live in the best hygienic way. He has been annoyed for some time with an eczematous condition of both ears. On November 14, 1876, he presented himself for treatment at the Philadelphia Infirmary for Diseases of the Ear. Both auditory canals were found plugged with a mass of whitish and tenacious layers, and this, on microscopic examination, was found to be chiefly composed of aspergillus in all stages of development. There was some itching in the ears, from which a watery discharge came.

*Treatment.*—Alcohol being used, in a short time all signs of the aspergillus disappeared.

In this case I believe the eczema preceded the growth of aspergillus, the latter being fostered by the use of various unguents for the cure of the former. The ointments collecting in the ear, with portions of dead animal matter from the aural discharges, formed a rancid and putrefying soil for the parasitic saprophyte.

CASE X.—*Aspergillus nigricans in the left auditory canal.*—Mr. J. N. B., of Philadelphia, aged forty years, living in the best of hygienic circumstances, came under observation March 29, 1877, for what he supposed was eczema of the left ear. Mr. B. stated that he has been liable to attacks of eczema throughout the body, for several years. Within a month he had had itching, pain, and sense of fulness, in the left ear, with a slight watery discharge. He had also pulled blackish scales from the ear, and at times he had had small furunculi near the meatus.

Inspection, by means of the aural mirror, revealed the membrana tympani to be covered with a fungous membrane or pellicle, under which the dermoid layer of the drum-head was macerated and reddened. The microscope revealed the presence of the aspergillus in a flourishing condition. There was unmistakable eczema of the meatus and outer part of the auditory canal.

*Treatment.*—The treatment consisted in the application of benzoated oxide of zinc ointment, by means of a camel's-hair brush, to the eczematous spots, and alcohol instillations were employed to destroy the fungus.

The undiluted alcohol proved too painful, as the skin was much broken by the eczema, but by diluting the alcohol with an equal amount of water, I was able to obtain the benefits of its application without the smarting and irritation.

By carefully watching the ear for any signs of renewal of the growth, and the continued use of the dilute alcohol instillations for ten days, the canal healed, the lustre returned to the membrana tympani, and the patient passed from treatment.

In this case, also, as in the previous one, eczema probably preceded and invited the aspergillus.

CASE XI.—*Aspergillus nigricans in the left auditory canal*.—The patient, a wine merchant of Philadelphia, sixty-seven years old, came under observation May 3, 1877, for hardness of hearing, supposed to be due to hardened cerumen. He was strong and well, and lived in comfort and good hygienic surroundings. He had felt, some weeks before I saw him, a buzzing in his left ear, attended with a slight diminution of hearing and an itching pain. A very slight watery discharge had run from his ear at times since these symptoms were first noticed, and his physician had syringed the ear several times, washing out each time a substance said to be cerumen.

Upon inspection of the ear there was detected, deep in the anterior part of the auditory canal, near the membrana tympani, in the angle formed by the latter and the anterior wall of the canal, a dirty-white mass, looking somewhat like moist newspaper. By examination with the microscope its true nature was shown to be aspergillus, in the form of a false membrane adherent to, and partially covering the anterior half of the membrana tympani.

*Treatment*.—I was able to seize this mass and lift it entirely from the membrana tympani, without pain to the patient. Beneath this mass the fundus of the auditory canal and that part of the membrana tympani covered by the fungus, was red and inflamed, but the free portion of the drum-head was normal in color. Alcohol was then instilled.

The next day a fresh patch of the fungus had grown in its former seat, and this I again removed with forceps. The alcohol instillations in this case caused some discomfort from the burning sensation in the ear. The patient then used, for a day or two, dilute alcohol at home and syringing with tepid water, under which treatment, by the 5th of May, the membrana tympani was found entirely free from the fungus, the hearing was good and there was no more tinnitus aurium.

On June 18th there was a slight return of the fungus, but under the resumption of the alcohol and the syringing, all symptoms vanished, and the ear remained free.

At the time of the relapse there were some furuncles in the auditory canal.

This man was the oldest person in whose ear I have found the aspergillus, and the case is further of interest from the pertinacity of the growth of the fungus. It never obtained great headway,



but it reappeared in the same spot several times while under my observation, and probably, from the history of the case, had reappeared several times while under the care of his family physician. It only shows that such cases must be carefully watched, and every fresh outcrop of the fungus removed until no trace of the parasite is to be found in the ear. If this is not done, a chronic and stubborn aural disease may be established.

CASE XII.—*Aspergillus nigricans* in the left auditory canal.—Adam Smith, thirty-eight years old, a wool carder, came to the Philadelphia Infirmary for Diseases of the Ear, September 21, 1877. His statement was that for some time he had been hard of hearing in the left ear; that the ear felt stopped up, and that a slight watery discharge came from it.

On inspection the auditory canal was found to be entirely filled from drum-head to the meatus with a soft, whitish plug of what finally was shown to be a mass of aspergillus in all stages of growth. This ear became very much inflamed, and the aspergillus grew with great pertinacity for some weeks. Alcohol was too painful to the ear in its inflamed state, and syringing with warm water was relied upon alone.

Perhaps this man's business, which exposed him to dampness and a constant surrounding of damp wool, impregnated with dead animal matter, favored the development and growth of the fungus. Be this as it may, this case was the first in which I had found aspergillus in an individual living in a decidedly unclean and poor way. And yet the general theory has been that this aural disease is found chiefly if not entirely, in the poor and squalid.

CASE XIII.—*Aspergillus nigricans* in both auditory canals.—(A.) Mr. W. W. J., aged sixty-two, a lawyer, living in the best of hygienic surroundings, came under observation September 27, 1877.

The statement of the patient was that during the summer, while at Atlantic City, where he did not bathe, he was affected with hardness of hearing rather suddenly, and for the first time in his life. Upon consulting a physician in the summer resort it was thought that the auditory canals were plugged with wax, and the ears were syringed upon several occasions by means of a fountain syringe. This brought away each time some plugs supposed to be of cerumen, but the ears did not become comfortable nor did the hearing become normal; the latter was muffled and there was some tinnitus, with slight and fleeting pains in the ear. There was no history of a discharge from the ears.

On inspection I found both canals plugged with a suspicious looking mass,

most evidently not cerumen. After syringing this out, each membrana tympani was found congested at the periphery and malleus, and the general surface was roughened and irritated in appearance to an extent not to be accounted for by the small amount of syringing I had used to cleanse the canals. There were no adherent patches of fungus, nor consequently any false membrane in either ear. The patient was not advised to pursue any treatment at home, but was asked to call in three days. Before this time elapsed the patient presented himself, on a Sunday morning, on account of the itching and discomfort in his ears.

It was found that the canals, which on Friday previous were dry, though a little scaly in appearance, but not congested, had become covered with a false membrane, which extended to and over the membrana tympani. This I removed by syringing with alcohol and water, one part to four, and by a little aid from delicate forceps. The membrana tympani on each side had assumed the thickened, reddened, and irritated appearance characteristic of *myringomycosis aspergillina*.

Portions of the false membrane thus removed, on being examined by the microscope, showed the various parts of the flourishing aspergillus.

The patient was seen the next day, when it was found that the false membrane had formed again, and the ears looked as they did the day before. The canals and membranæ tympani were again cleared and the patient ordered to syringe the ears at home and to instil thrice daily ten to fifteen drops of a solution of hyposulphite of soda in water, 3 gr. to f ʒ i.

This controlled the disease by checking the further growth of the fungus; the patient was seen every day until a week had elapsed, when no more fungus having appeared the case was dismissed, with the hearing perfect and the ears comfortable.

B. *September 2, 1878.*—A curious instance of a return of this fungus to an ear previously attacked by it was noted in this patient. The liability of return to an ear once invaded by the aspergillus has been noted by others, but the length of the interval between the attacks has not been given. In this case it was almost exactly one year.

The patient gave an account of an onset of dulness of hearing on the left side during the summer at Atlantic City, somewhat similar to that of the previous year.

There had been slight pain in both ears, with a sense of discomfort and fulness, but no discharge.

Upon examination there was found quite a large plug of epithelium and aspergillus in the left ear and a small mass of the same in the right ear.

The left ear was more tender and swollen than the right. The canals were syringed with alcohol and water, but at home the patient was not ordered to use any application to the ears, since I had resolved to make all the necessary

applications myself, having come to the conclusion that patients with aspergillus in the ear are apt to irritate their ears by treating themselves and thus favor the continued growth of the fungus. At most I order alcohol drops, if the ear itches greatly, to be used in the intervals between the visits to me; but no syringing. Of course I expect to see the case every day.

In the course of four days I found some false membrane of aspergillus in the left ear, but none in the right; the left ear was still painful and swollen. I applied alcohol and water, equal parts, and saw the patient the next day.

I again found some patches of aspergillus, but the ear was much less tender and swollen. The hearing was dull still. After removal of the patches of aspergillus the ear was syringed with alcohol and water, and from this time there was no return of the fungus in the ears.

It was found that this patient had been in the habit of using large quantities of soap-suds in the concha and in the meatus, with the idea of great cleanliness. This undue washing accounts for the growth of the fungus, as I think can be shown by reflecting that this manipulation would wash away the cerumen, the natural protector of the auditory canal. The skin would thus become irritated and a deposition of aspergillus-spores taking place, on this fitting soil, the fungus would gain lodgment in the ears. With its well-known tendency to seclusion, the parasite seeks, and soon spreads over, the bottom of the auditory canal and the drum-head, and thus can be explained the origin of the disease in this case as well as in numerous others.

CASE XIV.—*Aspergillus nigricans* in the left auditory canal.—Mr. R. S., aged 42, of Philadelphia; a watchman in a bonded warehouse, came to the Infirmary for Diseases of the Ear, November 15, 1877, complaining of earache, discharge from the ear, and hardness of hearing.

The patient thinks he caught cold from necessary exposure at night, in his duties as watchman. His general health is very good, his frame large and powerful, and his complexion very ruddy; he gets good wages and lives well.

On inspection, the membrana tympani was found perforated at the middle of the posterior half, and from the opening a mucous discharge of slight amount was observed to flow. Over the membrana tympani and about the perforation in it, there was seen a whitish, felt-like membrane, which was shown by the microscope to be composed of the aspergillus in flourishing condition.

I am disposed to think that the aspergillus had invaded this ear subsequently to a slight catarrhal inflammation of the drum-



cavity, attended with perforation of the membrana tympani. The ear was not attended to for some days, and the slight mucous discharge, being allowed to remain in the ear, supplied the necessary soil for the fungus, and this, by gaining root on the diseased drum-head, set up irritation and pain, which at last brought him to the Infirmary for relief. This case, like most others seen in Infirmarys, disappeared before the treatment was completed, and a satisfactory condition established in the ear. But, it serves as an example of the readiness with which the aspergillus springs up in an ear which has been the seat of inflammation, and in which a small quantity of the results of inflammation is allowed to remain and decompose.

CASE XV.—*Aspergillus nigricans in the left auditory canal.*—A. Miss Kate T., aged 24 years, a seamstress, was first seen in the Philadelphia Infirmary for Diseases of the Ear, September 26, 1877. She states that in the early part of the previous summer, without any warning, her left ear began to discharge a scanty, but offensive matter. As she was in the country at the time, nothing was done for the ear, until she came under treatment in the Infirmary.

On inspection of the ear, by means of the aural mirror and speculum, a polypus was seen seated over the position of the membrana flaccida, below which the lower part of the membrana tympani proper was seen to be intact, though macerated by the discharge which flowed from the region of the polypus. On examination by means of the probe, it was found that the polypus occupied the place of the membrana flaccida.

*Treatment.*—Part of the polypus was taken away at the first visit by means of Blakes-Wilde's snare and the remnant cauterized by means of chromic acid. The chromic acid was conveyed to the remnant of the polyp by means of cotton on the cotton-holder, by wrapping the end of the latter with cotton rolled tightly about it, until the end of the holder was about as large as a good-sized grain of shot. Then, with this cotton-bulb, a small crystal of chromic acid is crushed into a kind of paste, which adhering only to the end of the tuft, is conveyed to the diseased spot. Of course it is understood that only those prepared to skilfully treat diseases of the ear must undertake to perform this or any other delicate local treatment of disease of the ear. Not only knowledge of the parts and *their relation to each other* must be understood, but the art of conveying medication to the diseased organs, under full illumination of the auditory canal, by means of the forehead mirror, must have been mastered.

I consider this digression upon the subject of the art of treat-

ing locally aural diseases as necessary alike for the aurist's indemnification and for the patient's welfare.

On the 27th September, the next day, I removed a slough from the remnant of the polyp and applied more chromic acid. The discharge from the ear had become much less. On the following day I removed still more slough, and exposed to view all of the membrana tympani, below the folds. It was now seen that the polypus sprang, by a broad attachment, from the entire surface of the spot occupied by that part of the drum-head known as Shrapnell's membrane, or the membrana flaccida. The cut surface of the attachment now amounted to an ulceration of the above-named territory.

Between this time and the 1st October following, two more applications of the chromic acid were made, and by the end of a week the ulcerated surface was on a level with the rest of the membrana tympani. At home the patient used a 2 gr. solution of sulphate of zinc in water, and syringing. The discharge, by the 3d of October, was reduced to a minimum. The ulcerated surface was now touched with a saturated solution of nitrate of silver (480 gr. to f.  $\frac{3}{4}$  i. of water), conveyed to it in the same manner as the chromic acid, alluded to above.

The conveyance of nitrate of silver, by means of a button or tuft of absorbent cotton, twisted tightly about a cotton-holder, has seemed to me to be equivalent to the use of a button of the solid stick, fused to a probe. It is surely a more convenient way, and I dare say a safer one, for I never saw a button of nitrate of silver fused to a metal stem that was not brittle, and hence liable to come off either at a time or in a quantity not to be desired.

Two days later the ear was examined and it was seen that a slight discharge bathed the ulcerated spot, and that the membrana tympani was congested about the malleus. The zinc drops were continued and the ear was syringed, but beyond this no local treatment was carried out.

The next day, October 6, there was a slight soreness of the meatus, which I felt was due to the excessive manipulation the ear necessarily had been subjected to. I, therefore, blew into the canal, and over the membrana tympani, a little drying powder, composed of one part of salicylic acid to two of magnesia (Chisholm), and told the patient to leave the ear alone.

Four days thereafter I saw the patient, and there was a necrotic spot in the place of the short process of the malleus. The discharge had ceased, but I again insufflated the above-named powder, and then ordered the ear to be let alone.

The next day the ear felt comfortable; the ulceration appeared to be heal-

ing, though still smeared with a little creamy pus. This was dried off by absorbent cotton. There was no odor, but the black, rough, necrotic spot over the short process remained unchanged. The treatment consisted in *my* keeping the ear clean, the patient *doing nothing at home*.

By the 17th October, my note-book states, there was no change in the black spot over the short process, and there was scarcely a trace of discharge. The dry treatment was then kept up for two days longer, when the ear ceased to discharge. It may be said that now the ear had passed into another condition. The hearing was not much improved, but all pain, soreness, and discharge had ceased, and it was seen that the membrana flaccida had healed, but not with a normal appearance, as it was sunken and irregular in surface. At no time was there detected a perforation into the tympanic cavity, from the ulcerated surface. There was still the black spot of necrosis, which sat like a cap over the short process. This, of course, I felt would be fertile soil for the aspergillus, and I therefore not only watched it closely day by day, but applied, October 19th, glycerine and salicylic acid (gr. xvi. to f.  $\frac{3}{4}$  i.) to the diseased spot, by means of cotton on the cotton-holder.

The patient, now considering herself well, and also finding it inconvenient to come to me, absented herself for exactly one month.

On the 19th of November, the necrotic spot over short process was found *unchanged*; there was marked irritation of the membrana tympani and of the fundus of the auditory canal, and a slight dark-colored discharge smeared the seat of the old ulcer, and the membrana tympani. The ear was then cleansed of this discharge, which proved to be very offensive and irritating, and the necrotic spot was again touched with the above-named mixture of glycerine and salicylic acid. It seemed that this offensive discharge came from the necrotic spot, not from the old ulcer, in the membrana flaccida. In the course of two days a *fine yellow, pollen- or felt-like substance*, was found around the walls of the auditory canal, near the membrana tympani. This *proved to be* the early stages of a growth of aspergillus.

The ear was thoroughly syringed with alcohol and water, and all traces of the fungus were thus removed as far as possible. The ulceration at the membrana flaccida was apparently breaking out again.

Two days subsequent to this, the ear was again seen and a mycelial membrane was found over the upper part of the drum-head; the necrosis of the short process was no better—perhaps extending a little; the membrana tympani at its upper part was raw beneath the fungous web, while its lower part remained unattacked. The patient complained of *beating in the ear*. Three days later, November 26th, a large piece of the mycelial web, one-quarter inch square, was washed from the ear. Since the last visit, the patient had used alcohol instillations and syringing, and this may account for the rapid detach-



ment of large pieces of the fungous mass. The necrosed spot on the short process seemed to be moving, *i. e.*, growing off and leaving a clean short process beneath. The necrosis seemed to have ceased.

The ear was watched closely again, and the use of alcohol washes and the syringe kept up, several times daily, for two days longer.

Two days later, there was no trace of aspergillus, and *the eschar on the short process was seen to be decidedly growing forward and off, what now began to look like a normal short process.*

This black spot continued to narrow, and a scaly coat of epithelium formed around and over it. In the course of a month this rough coat of epithelium had covered the eschar, or rather the site of the eschar, and had moved upward and away from the short process, leaving the latter perfectly normal, and had covered the ulceration in the membrana flaccida. The ear then became entirely dry and comfortable to the patient, though the hearing was not much improved.

B. On April 4, 1878, a little over three months from her last visit to me, the patient presented herself again, with the statement that for two weeks she had felt pain and soreness in the left ear, and that three days before her call on me, she had noticed a watery discharge from the ear, since which the pain and burning had ceased.

*Treatment.*—On inspection, the concha was found red and tender, and the canal swollen. In the latter, at the fundus and over the old ulceration, there was found some deposit of aspergillus, which was removed and the ear syringed with alcohol and water, and the patient told to instil alcohol and water at home, but not to syringe. By omitting the use of the syringe while instilling alcohol in such cases, the parasiticide is brought not only in contact with the parasite, but is kept in contact with it for longer intervals than if the syringe were employed in the domestic treatment. I also blew into the ear some of the powder of salicylic acid and magnesia, already mentioned. This soon cleared the drum-head, and there were no signs of regrowth of fungus by the 5th of May, when the patient again passed from observation.

C. On July 19, 1878, there was a return of symptoms of aspergillus in the ear, which led me to think that perhaps the patient passed from observation too soon, in May, and that the fungus had kept a hold on the ear ever since.

The microscope revealing the presence of the inveterate fungus, the ear was carefully cleansed with alcohol and water, and equal parts of alcohol and water were instilled twice a day, by the patient at home, but she did not syringe the ear.

By the 31st of July, under this treatment, kept up each day, the membrana tympani once more became clear and lustrous; nevertheless, for the sake of safety, the patient was ordered to keep up the use of the alcohol as above stated, and this was done until the 9th of August, when the ear appearing well

rid of the parasite, all treatment was discontinued, and the patient has not been seen since.

The formerly ulcerated space at the membrana flaccida was cicatrized and dry when the patient was dismissed. The short process was normal.

CASE XVI.—*Aspergillus nigricans in the left ear*.—John H., thirty-seven years old, Irishman, living in Philadelphia, groom and driver for a grocer, came under observation November 7, 1877. The patient complained of deafness in the left ear, which he said dated back two years. From the subsequent history, it seems likely he then suffered from an acute attack of otitis media catarrhalis. This hardness of hearing continued without much change and with tinnitus in the affected ear, until he applied at last for relief. His hearing was found to be reduced in the left ear to a foot for words of ordinary tone. The membrana tympani was largely perforated in the posterior and inferior quadrant. The inner tympanic wall was red and roughened. This reddened and secretory surface was touched with saturated solution of nitrate of silver, on the day of his first visit to me, November 7th.

By the 19th, the discharge had been checked for several days, but over what was once the region of the perforation there was seen a bluish-white membrane, and around it a yellow, pollen like, downy substance. The latter, under the microscope, was resolved into young fruit-heads of the *aspergillus nigricans*, with short stems and no sterigmata.

Patient complained of tinnitus and increase of hardness of hearing. By using the syringe, I removed all visible *aspergillus*, and relieved the tinnitus. By the 23d, two days later, the patient reported another attack of tinnitus and muffling of the hearing. Again, false membrane of fungous growth was found, some of which *extended to the tympanic cavity*, from the outer side of the membrana tympani, through the perforation.

The ear was now syringed with alcohol and water, and alcohol undiluted was instilled into the ear by the patient at home. The alcohol instillations were kept up for a month, as the *aspergillus* was found in small quantities once or twice within this period of time. On 28th December, the ear was found free from all traces of *aspergillus*, and the hearing had increased to two feet, **against six inches on his first examination.**

For the sake of precaution, alcohol was instilled into the affected ear for some weeks. There was no return of the fungous growth. By the 16th of April, 1878, the meatus was found to be somewhat reddish, but the membrana tympani was clear and the perforation had healed up, the cicatrix being somewhat depressed.

CASE XVII.—*Aspergillus nigricans in the left ear*.—Wm. H., aged twenty-two, born in Philadelphia, clerk in a large warehousing company, came under observation originally in January, 1875, for chronic purulent discharge from the left ear. The discharge was cured and the hearing very much improved,

and the patient disappeared until December, 1877, when he again visited me. His statement now was that within four or five months he had noted a return of discharge from the previously affected ear. He had no reason to assign for this return of discharge, and in fact would not have consulted me for this had not the ear grown suddenly painful and robbed him of sleep.

His hearing in the left ear was found to be  $\frac{6}{10}$  for the watch and almost contact (?) for the voice. The membrana tympani was macerated, its contours destroyed, and the wall at fundus of canal was dotted with four or five little granulations. The latter were thoroughly touched with a saturated solution of nitrate of silver, and the patient was told to syringe his ear at home. After the syringing he was to use instillations of a 3 gr. solution of sulphate of zinc. The next day the granulations were again touched as above.

In ten days from this time, the solution of zinc and the syringe having been used, there was scarcely a trace of discharge seen in the ear. The granulations had disappeared, the membrana tympani was retracted, malleus visible, but apparently adherent to the inner wall of tympanum.

Ten days now elapsed, when, on January 7, 1878, the auditory canal was found to be very much congested and the canal walls undergoing great exfoliation of epidermis. There were no granulations, but there was a slight discharge, for which was ordered the previous solution of sulphate of zinc.

Some suspicious scales, washed from the ear at this visit, were examined under the microscope, and found to contain masses of mycelial net work, but no fruit stalks of the aspergillus.

In this case I syringed the ear nearly every day for three weeks with alcohol and water, in about equal parts, and removed any suspicious-looking scales. At the end of this time no sign of aspergillus could be discovered, though there was a slight discharge from the walls of the external auditory canal. For this instillations of 2 gr. subacetate of lead to the fluid ounce of water were used.

On February 2d I noted that there was no discharge from the ear, and there had been none for a week, since, in fact, powdered alum had been blown into the canal, on the 26th of the previous month. The hearing had improved to one yard and the ear was easily inflatable by Politzer's method.

CASE XVIII.—*Aspergillus nigricans in both ears*.—Mr. W. A. T., thirty-four years old, born in Philadelphia, came under observation January 28, 1878, in the Philadelphia Infirmary for Diseases of the Ear. The patient states that he has been "deaf three years," after catching a heavy cold; never had running from his ear, nor is there an ear disease in his family. He has had rheumatism in his knees. His business lies along the wharf, and he is exposed to all kinds of weather. His hearing is reduced to a few inches for ordinary tones of speech.

For two or three weeks he had felt great itching and stinging in his ears,



and he had picked at and scratched them until he had excited an eczema in each.

From the *right* ear cerumen plug was removed on 28th of January, when there was no trace of aspergillus found; but on the 2d February the aspergillus was found in this ear.

On the *left* side the meatus was very much swollen, the membrana tympani invisible. The eczema was great in the fossa antihelicalis of the auricle, where, indeed, it had passed into ulceration.

For the eczema, Lotio nigra was prescribed. The most flourishing aspergillus nigricans was found at the outset in the right ear. Before any satisfactory results could be obtained the patient disappeared after the third visit.

It is interesting to note that in this case the aspergillus did not make its appearance in the right meatus until the cerumen plug was removed from the ear, which would seem to add confirmation to the idea that the wax of the ear tends to keep the fungus away, *i. e.*, the latter will not grow in or near healthy cerumen, as already alluded to in Case VIII.

CASE XIX.—*Aspergillus nigricans in the right auditory canal.*—Mrs. B. F., of Philadelphia, aged forty years, living in good circumstances, came under observation July 1, 1878. She states that she has been liable to attacks of earache and discharge on the right side for several months past, for which no reason could be assigned and which her family physician had failed to control. The hearing was not very much affected, however. There was history of a slight disease in this ear after scarlatina in early childhood.

The membrana tympani was found perforated at the posterior inferior quadrant, over which there was a small granulation attached to the dermoid layer of the drum-head. The condition of the ear seemed to denote that the disease had originated in the auditory canal and had ulcerated the drum-head from without inward. There was nothing visible in the ear which suggested fungous membrane, the granulation over the perforation was touched with saturated solution of nitrate of silver, and powdered alum was blown into the external ear. When the patient was seen a week later it was found that the perforation had closed and that the discharge had ceased. A week later still, the patient came with the statement that the pain had recurred and a slight discharge had reappeared. The membrana tympani was found perforated again. The patient was to use only warm-water syringing. In two days from this time large quantities of aspergillus nigricans were found in the ear.

Alcohol and water in equal parts were now dropped into the ear, and this was continued for three weeks, after which time no further traces of asper-

gillus were found. But the fundus of the canal still continued, until October 4th, to discharge a little, and the drum-head was covered usually with a drop or two of pus. This, however, was entirely checked by the use of the following prescription:

R. Liq. plumbi subacetatis..... ℥<sub>xx</sub>.  
 Acidi acetici diluti..... ℥<sub>vj</sub>.  
 Liq. opii sedativi..... ℥<sub>xx</sub>.  
 Aq. destill. q. suf..... f. ʒj.

M.

S. Ten drops warmed, in the ear, as directed.

This prescription is one of Hinton's, used by him especially for furunculous inflammation in the meatus. I have found it very useful in any discharge arising from the walls of the external auditory canal.

On October 18th I made this note in the case: The use of the above prescription had the immediate effect to dry up the discharge. The ear looks very much better; the fundus is red and the membrana tympani congested at posterior part, but it is dry and scaly. Its anterior half is gray and looks as though opaque from old catarrh. The hearing is good; in fact it has never been impaired to any extent. Notwithstanding these good symptoms the patient has had some earache; but this is evidently neuralgic, from bad teeth. This, the pulling out of the defective teeth, four of them, proved to be the case.

By October 25th the membrana tympani was observed to be opaque and lustreless, but pale and *dry*, and the fundus of the auditory canal near the drum-head was pale, dry, and shining. Near the membrana tympani, on the posterior wall of the auditory canal, there is a round, flat hillock, shining, pale, and covered with skin, about as large as the head of a large pin. I did not touch it with the probe.

CASE XX.—*Aspergillus nigricans* in right auditory canal.—Mr. W. E. L., forty years old, born in Philadelphia; manufacturer, living in the best of hygienic circumstances, came under observation September 14th, 1878. He states that during the past summer he had an attack of soreness, redness, swelling, and pain about and in the external ear, which was said by his family physician to be erysipelas. The history of this attack is not clear; the treatment of it consisted in painting the parts near the auricle with iodine and putting cocoa butter in the ear. The patient also has used for some time an aurilave, with which he has swabbed his ear until he has packed the canal with debris of ear-wax, pus, epithelium, etc., and brought about an excoriated state of the walls of the canal. I found the meatus of the affected ear somewhat tender to the touch, and firmly occluded by a hardened plug of cerumen, etc. The hearing was reduced to a few inches for conversational tones.

After washing out the hardened wax-plug the hearing became nearly normal. The membrana tympani was found covered with numerous granulations, and there were also some granulations in the meatus on its walls.

*Treatment.*—The granulations were touched with saturated solution of nitrate of silver at the first visit, and once or twice subsequently, and in the course of ten days the membrana tympani was found dry and shining, and the granulations entirely gone from the ear. Hearing normal.

Two days later, on 28th September, the patient called, saying that his ear had suddenly begun to feel sore and full, that a watery discharge came from it, and he could not hear as well as he had done a few days previously. On examination a foreign moist substance was seen filling the fundus of the canal. This, when washed out, proved to be suspicious-looking flakes or membranes. The meatus wall was free from false membrane, but moist, and the membrana tympani was lustreless, congested at the malleus and periphery, and dotted with suspicious white flakes. The canal was now syringed with alcohol and water.

The microscope revealed the presence of aspergillus in early as well as advanced stages, and there were some free spores, showing of course considerable age on the part of the fungus in the ear. The patient was told to use alcohol and water, in equal parts, in the ear twice daily and to syringe the ear with tepid water also twice daily.

In the course of two days the aspergillus seemed to have been destroyed, as the membrana tympani once more became smooth and shining. The skin on the walls of the auditory canal still looked red and decidedly thicker than the normal, as is apt to be the case where the "aurilave" has been habitually employed.

*Age.*—In the twenty cases just given, the ages varied from fifteen to sixty-seven years. The oldest and the youngest being males.

*Ear affected.*—Only the right ear was affected in 7 cases.

" left " " " " 9 "

Both ears were affected " 4 "

*Sex.*—Fourteen cases occurred in males and six in females.

*Recurrences.*—There were two recurrences within a year in Case XV., that of a young woman twenty-four years old. There was one recurrence within a year, in a gentleman sixty-two years old, in which case the recurrence was in both ears, as was the original attack. It may be said that there was a recurrence in Case VII., as Dr. H. N. Spencer had once found the fungus in Mr. J.'s ear before it was detected by the writer.



## GENERAL REMARKS.

*Symptoms.*—The symptoms of the growth of this parasitic fungus in the external ear may be briefly given as, stinging, itching, with dulness of hearing, some pain and a watery but scanty discharge. The patient may finally complain of great pain and deafness, if the membrana tympani should become inflamed.

An ear thus affected will show, on examination, the presence in it of a grayish, sometimes mottled, flaky mass, or if examined in the earlier stages of disease, it reveals the presence of a false membrane neatly adapted to the membrana tympani and the inner part of the auditory canal. From this point the false membrane may, sometimes does, extend along the canal until it projects from the orifice at the concha of the auricle. When seen in its early stages of growth, the false membrane over the drum-head looks dry and downy, and somewhat shining; later it looks crumpled, and resembles a piece of wet newspaper. Any free edge of the membrane visible will appear much thicker than flakes of epithelium. Once seen, this parasitic membrane is easily recognized again. The diagnostic features of such a false membrane or fungous mass may be learned from what has already been said under the head of *Macroscopic Appearances*, p. 16, No. 1 of this Journal.

If any doubt should exist about the presence of aspergillus in the ear it is usually dissipated in a day or two, on the return of the patient, for, unless the treatment has been the proper one and very successful, the false membrane will have formed again. This, of course, removes all doubts, and should prompt us to great activity and watchfulness, or we shall have a stubborn disease to combat.

The microscope will remove all doubts as to the nature of any suspicious-looking flake or lump removed from the ear.

*Etiology.*—It must be evident to the reader of the details of the twenty cases here presented, that this disease is not confined to those living in poverty and squalor. In fact, my experience is the reverse of this. Only three cases, Nos. IX., XII., and XVI., could be said to have occurred in the poor and unclean. As long as the secretion of ear-wax is unimpeded and, when secreted, if the cerumen is not scraped away, no one is likely to be affected by asper-

gillus in the ear. If the ceruminous secretion is disturbed in any way, especially if now the skin of the auditory canal be abraded, anybody may be, probably will be, attacked by this parasite. The chief causes of the growth of this parasitic fungus in the ear, I find to be undue picking and scratching of the ear, and dropping in and leaving there oils and fats of various kinds and pieces of vegetable matter. These becoming rancid, or putrescent, a fitting soil for the *aspergillus* is given.

Next to these causes, is the neglect to wash the ear after it has been the seat of boils or any inflammation, which may leave behind it small particles of pus, serum, blood, etc. It is needless to say that all of the latter, when putrid, may become the nidus of a colony of *aspergillus*.

If the patient should be living in damp apartments, of course, this must be ended, if possible, either by cleansing and drying his dwelling, or by removal from this probable source of disease. If any other excitant can be shown to be the probable cause of the growth of the fungus in the ear, of course it must be removed, if possible.

I must repeat here what I have written elsewhere<sup>1</sup> concerning the protective function of cerumen. There is no evidence that the *aspergillus* grows on the natural ceruminous secretion of the auditory canal. It appears, indeed, that but for the presence of the cerumen in the canal, the ear might be invaded more frequently by the *aspergillus*, since the latter seeks a secluded spot for growing. The protection of the cerumen in this particular, is shown in the fact that in an ear, the canal of which is sheathed with ear-wax, *aspergillus* is rarely found at all, and never in a flourishing condition, while in an ear invaded by *aspergillus*, cerumen is rarely, if ever, found in a normal quantity or condition. (See Cases VIII. and XVIII.) In the latter case, had I not used different syringes for the two ears, I would have thought I had transmitted the parasite from the ear first diseased, the left, to the right ear.

On this point of contagion I am very careful, for it would be very easy to convey *aspergillus* from one person to another, not only by the syringe, but by specula, cotton-holders, etc.

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<sup>1</sup> Philadelphia Medical Times, June 22, 1878.

*Treatment.*—The treatment of aspergillus in the ear consists in killing and removing all parts of the plant, and especially all its germs. The syringe is the best means of removing the parasite, after it forms into false membrane, but if the latter be adherent, other mechanical means may be necessary. Hence I find it useful, if the fungous membrane has reached any size, or if it be visible as whitish flakes or spots, to wipe these traces of it away from or off the walls and membrana tympani, by means of the cotton dossil on the cotton-holder. This is easily done, and causes no pain to the patient. If these patches should be very adherent, they must not be forcibly removed. They are to be loosened then, either by time or by the use of a parasiticide. Experience shows me that these false membranes are not usually adherent, but easily detached. I have never employed but two parasiticides, viz.: alcohol, usually pure, but sometimes in various proportions with water, rarely weaker than one of the former to two of the latter, and hyposulphite of soda.

My solitary experience with hyposulphite of soda (Case XIII.), three grains to the fluid ounce of water, leads me to place it next to alcohol, as a destroyer of the aspergillus. In the future I propose to use it more frequently than in the past. I have found it of advantage to let the patient use the drops which are to destroy the parasite, without subsequent syringing on his part, for reasons given already in the treatment of Case V. Of course this omission of syringing on the patient's part can only be permitted when he can be seen by an aurist daily. The greatest gentleness is requisite in all cases of aspergillus in the ear, lest eczema be excited, since in all these cases the ear seems to possess a readiness to slip into the eczematous state.

Of course, should this complication arise in the parasitic disease, it must be combated on general principles. If possible, all fatty matter should be excluded from the treatment of eczema in these cases, since oleaginous substances feed the fungus<sup>1</sup> (see Case IX.). I have found that the eczema in these cases could be combated

<sup>1</sup> The investigations of Bezold, of Munich, have fully confirmed the fact that the use of oleaginous matters for the cure of ear diseases is very often the cause of the growth of aspergillus in the ear.



with the powder named in the treatment of Case IV. The prognosis in the disease is uniformly favorable.

In conclusion, it may be said the ear thus diseased should be carefully examined by means of the ear-mirror and speculum every day, and the treatment modified according to the stages of the disease. The least irritation of the ear, combined with the most efficient destruction and mechanical removal of the parasite, will give the most satisfaction to both surgeon and patient.





